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FEDERAL AVIATION ADMINISTRATION

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Washington, D.C. 20591

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AIP AMENDMENT LIST

March 1995

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4.11.5 Notices to Airman (NOTAMs) are issued for LORAN-C chain or station outages. Domestic NOTAM (D)'s are issued under the identifier "LRN." International NOTAMs are issued under the KNMH series. Pilots may obtain these NOTAMs from Flight Service Station briefers upon request.

4.11.6 LORAN-C status information

Prerecorded telephone answering service messages pertaining to LORAN-C are available as follows:

RATE	CHAIN	TELEPHONE
5930	Canadian East Coast	709-454-3261*
7980	Southeast U.S.	904-569-5241
8970	Great Lakes	607-869-5395
9960	Northeast U.S.	607-869-5395

*St. Anthony, Newfoundland, Canada

Information can also be obtained directly from the office of the Coordinator of Chain Operations (COCO) for each chain. The following telephone numbers are for each COCO office:

RATE	CHAIN	TELEPHONE	LOCATION
4990	Central Pacific	808-247-5591	Kaneohe, HI
5930	Canadian East Coast	709-454-2392	St. Anthony, NF
5990	Canadian West Coast	604-666-0472	Vancouver, BC
7930	North Atlantic	011-44-1-409-4758	London, UK
7960	Gulf of Alaska	907-487-5583	Kodiak, AK
7970	Norwegian Sea	011-44-1-409-4758	London, UK
7980	Southeast U.S.	205-899-5225	Malone, FL
7990	Mediterranean Sea	011-44-1-409-4758	London, UK
8290	North Central U.S.	707-987-2911	Middletown, CA
8970	Great Lakes	607-869-5393	Seneca, NY
9610	South Central U.S.	205-899-5225	Malone, FL
9940	West Coast U.S.	707-987-2911	Middletown, CA
9960	Northeast U.S.	607-869-5393	Seneca, NY
9970	Northwest Pacific	415-437-3224	San Francisco, CA
9990	North Pacific	907-487-5583	Kodiak, AK

4.12 OMEGA and OMEGA/VLF Navigation Systems

4.12.1 *Omega*

4.12.1.1 Omega is a network of eight transmitting stations located throughout the world to provide worldwide signal coverage. These stations transmit in the Very Low Frequency (VLF) band. Because of the low frequency, the signals are receivable to ranges of thousands of miles. The stations are located in Norway, Liberia, Hawaii (USA), North Dakota (USA), La Reunion, Argentina, Australia, and Japan.

4.12.1.2 Presently each station transmits on four basic navigational frequencies: 10.2 kHz, 11.05 kHz, 11.3 kHz, and 13.6 kHz, in sequenced format. This time sequenced format prevents inter-station signal interference. The pattern is arranged so that during each transmission interval only three stations are radiating, each at a different frequency. With eight stations and a silent .2-second interval between each transmission, the entire cycle repeats every 10 seconds.

4.12.1.3 In addition to the four basic navigational frequencies, each station transmits a unique navigation frequency. An Omega station is said to be operating in full format when the station transmits on the basic frequencies plus the unique frequency. Unique frequencies are presently assigned as follows:

Station A Norway	12.1 kHz
Station B Liberia	12.0 kHz
Station C Hawaii	11.8 kHz
Station D North Dakota	13.1 kHz
Station E La Reunion	12.3 kHz
Station F Argentina	12.9 kHz
Station G Australia	13.0 kHz
Station H Japan	12.8 kHz

4.12.1.4 Interruptions in service of Omega navigation facilities are advertised by NOTAM (Class I).

4.12.2 *Omega/VLF*

4.12.2.1 The U.S. Navy operates a communications system in the VLF band. The stations are located worldwide and transmit at powers of 500-1000 kW. Some airborne Omega receivers have the capability to receive and process these VLF signals for navigation in addition to Omega signals. The VLF stations generally used for navigation are located in Australia, Japan, England, Hawaii and on the U.S. mainland in Maine, Washington state, and Maryland.

4.12.2.2 Although the Navy does not object to the use of VLF communications signals for navigation, the system is not dedicated to navigation. Signal format, transmission, and other parameters of the VLF system are subject to change at the Navy's discretion. The VLF communications stations are individually shut down for scheduled maintenance for a few hours each week. Regular NOTAM service regarding the VLF system or station status is not available. However, the Naval Observatory provides a taped message concerning phase differences, phase values, and shutdown information for both the VLF communications network and the Omega system (phone 202-653-1757).

4.12.3 *Operational Use of Omega and Omega/VLF*

4.12.3.1 The Omega navigation network is capable of providing consistent fixing information to an accuracy of +/-2 NM depending upon the level of sophistication of the receiver/processing system. Omega signals are affected by propagation variables which may degrade fix accuracy. These variables include daily variation of phase velocity, polar cap absorption, and sudden solar activity. Daily compensation for variation within the receiver/processor, or occasional excessive solar activity and its effect on Omega cannot be completely forecast or anticipated. If an unusual amount of solar activity disturbs the Omega signal enlargement paths to any extent, the U.S. Coast Guard advises the FAA and an appropriate NOTAM is sent.

4.12.3.2 At 16 minutes past each hour, WWV (Fort Collins, Colorado) broadcasts a message concerning the status of each Omega station, signal irregularities, and other information concerning Omega. At 47 minutes past each hour, WWVH (Hawaii) broadcasts similar information. The U.S. Coast Guard provides a taped Omega status report (phone 703-313-5906). NOTAMs concerning Omega are available through any Flight Service Station. Omega NOTAMs should be requested by Omega station name.

4.12.3.3 The FAA has recognized Omega and Omega/VLF systems as an additional, but not the sole, means of en route IFR navigation in the conterminous United States and Alaska when approved in accordance with FAA guidance information. Use of Omega or Omega/VLF requires that all navigation equipment otherwise required by the Federal Aviation Regulations be installed and operating. When flying RNAV routes, VOR and DME equipment is required.

4.12.3.4 The FAA recognizes the use of the Naval VLF communications system as a supplement to Omega, but not the sole means of navigation.

4.13 Inertial Navigation System (INS)

4.13.1 The Inertial Navigation System is a totally self-contained navigation system, comprised of gyros, accelerometers, and a navigation computer, which provides aircraft position and navigation information in response to signals resulting from inertial effects on system components, and does not require information from external references. INS is aligned with accurate position information prior to departure, and thereafter calculates its position as it progresses to the destination. By programming a series of waypoints, the system will navigate along a predetermined track. New waypoints can be inserted at any time if a revised routing is desired. INS accuracy is very high initially following alignment, and decays with time at the rate of about 1-2 nautical miles per hour. Position update alignment can be accomplished inflight using ground based references, and many INS systems now have sophisticated automatic update using dual DME and or VOR inputs. INS may be approved as the sole means of navigation or may be used in combination with other systems.

4.14 Doppler Radar

4.14.1 Doppler Radar is a semiautomatic self-contained dead reckoning navigation system (radar sensor plus computer) which is not continuously dependent on information derived from ground based or external aids. The system employs radar signals to detect and measure ground speed and drift angle, using the aircraft compass system as its directional reference. Doppler is less accurate than INS or OMEGA however, and the use of an external reference is required for periodic updates if acceptable position accuracy is to be achieved on long range flights.

4.15 Flight Management System (FMS)

4.15.1 The Flight Management System is a computer system that uses a large data base to allow routes to be preprogrammed and fed into the system by means of a data loader. The system is constantly updated with respect to position accuracy by reference to conventional navigation aids. The sophisticated program and its associated data base insures that the most appropriate aids are automatically selected during the information update cycle.

4.16 Global Positioning System (GPS)

4.16.1 b. General

4.16.1.1 The GPS is a United States satellite-based radio navigational, positioning, and time transfer system operated by the Department of Defense (DoD). The system provides highly accurate position and velocity information and precise time on a continuous global basis to an unlimited number of properly-equipped users. The system is unaffected by weather and provides a worldwide common grid reference system based on the earth-fixed coordinate system. For its earth model, GPS uses the World Geodetic System of 1984 (WGS-84) datum. GPS provides two levels of service: Standard Positioning Service (SPS) and Precise Positioning Service (PPS). SPS provides, to all users, horizontal positioning accuracy of 100 meters with a probability of 95 percent and 300 meters with a probability of 99.99 percent. PPS is more accurate than SPS; however, this is limited to authorized U.S. and allied military, federal government, and civil users who can satisfy specific U.S. requirements.

4.16.1.2 GPS operation is based upon the concept of ranging and triangulation from a group of satellites in space which act as precise reference points. A GPS receiver measures distance from a satellite using the travel time of a radio signal. Each satellite transmits a specific code, called a course/acquisition (CA) code, which contains information on the satellite's position, the GPS system time, its clock error, and the health and accuracy of the transmitted data. GPS satellites have very accurate atomic clocks in order to calculate signal travel time. Knowing the speed at which the signal traveled (approximately 186,000 miles per second) and the exact broadcast time, the distance traveled by the signal can be computed from the arrival time.

4.16.1.3 The GPS receiver matches each satellite's CA code with an identical copy of the code contained in the receiver's database. By shifting its copy of the satellite's code, in a matching process, and by comparing this shift with its internal clock, the receiver can calculate how long it took the signal to travel from the satellite to the receiver. The distance derived from this method of computing distance is called a pseudo-range because it is not a direct measurement of distance, but a measurement based on time. Pseudo-range is subject to several error sources; for example, an ionospheric delay, and time disparities between the atomic clocks in the satellites and the GPS receiver. In addition to knowing the distance to a satellite, a receiver needs to know the satellite's exact position in space; this is known as its ephemeris. Each satellite's signal transmits ephemeris information about its exact orbital location. The GPS receiver uses this information to precisely establish the position of the satellite. Using the calculated pseudo-range and the position information supplied by the satellite, the GPS receiver mathematically determines its position by triangulation. The GPS receiver needs at least three satellites with timing corrections from a fourth satellite to yield an unaided, unique, and true three-dimensional position (latitude, longitude, and altitude) and time solution. The GPS receiver computes navigational values such as distance and bearing to a waypoint, ground speed, etc., by using the aircraft's known latitude/longitude and referencing these to a database built into the receiver.

4.16.1.4 The GPS constellation of 24 satellites is designed so that a minimum of five are always observable by a user anywhere on earth. The receiver uses data from the best four satellites above its horizon, adding signals from one as it drops signals from another, to continually calculate its position.

4.16.1.5 The GPS receiver verifies the integrity of the signals received from the GPS constellation through receiver autonomous integrity monitoring (RAIM) by determining if a satellite is providing corrupted information. At least one satellite, in addition to those required for navigation, must be in view for the receiver to perform the RAIM function; thus, RAIM needs 5 satellites in view, or 4 satellites and baro-aiding to work. RAIM needs 6 satellites in view (or 5 satellites with baro-aiding) to isolate the corrupt satellite signal and remove it from the navigation solution. Baro-aiding is a method of augmenting the GPS solution equation by using a non-satellite input source. Baro-aiding uses the pressure altitude corrected for the local barometric pressure setting to provide accurate altitude information to the GPS receiver.

4.16.1.6 The Department of Defense declared initial operational capability (IOC) of the U.S. Global Positioning System (GPS) on December 8, 1993. The Federal Aviation Administration (FAA) has granted approval for U.S. civil operators to use GPS equipment to conduct oceanic, domestic en route, terminal IFR operations, and certain instrument approach procedures (IAP's). This approval permits the use of GPS in a manner that is consistent with current navigation requirements.

4.16.2 Requirements

4.16.2.1 Authorization to conduct any GPS operation under IFR requires that:

4.16.2.2 The GPS navigation equipment used must be approved in accordance with the requirements specified in TSO C-129, or equivalent, and the installation must be made in accordance with Notice 8110.47 or 8110.48, the equivalent Advisory Circular or the Flight Standards/Aircraft Certification (AFS/AIR) joint guidance memorandum dated July 20, 1992. Equipment approved to TSO C-115a do not meet the requirements of TSO C-129.

4.16.2.3 Aircraft using GPS equipment under IFR must be equipped with an approved and operational alternate means of navigation appropriate to the flight. Active monitoring of the alternative navigation equipment is not required if the installation uses RAIM for integrity monitoring. For these systems, active monitoring by the flightcrew is only required when the RAIM capability of the GPS equipment is lost.

4.16.2.4 Procedures must be established for use in the event that the loss of RAIM capability is predicted to occur. In situations where this is encountered, the flight must rely on other approved equipment, delay departure, or cancel the flight.

4.16.2.5 The GPS operation must be conducted in accordance with the FAA-approved aircraft flight manual (AFM) or flight manual supplement.

4.16.2.6 Aircraft navigating by GPS are considered to be RNAV aircraft. Therefore, the appropriate equipment suffix must be included in the ATC flight plan.

4.16.2.7 Prior to any GPS IFR operation the pilot should review the appropriate NOTAMs. Notams will be issued to announce outages. Pilots may obtain these NOTAMs from FSS briefers upon request.

4.16.2.8 Air carrier and commercial operators conducting GPS IFR operations shall meet the appropriate provisions of their approved operations specifications.

4.16.3 Use of GPS for IFR Oceanic, Domestic En Route, and Terminal Area Operations

4.16.3.1 GPS IFR operations in oceanic areas can be conducted as soon as the proper avionics systems are installed provided the general requirements of this NOTAM are met. A GPS installation with TSO C-129 authorization in class A1, A2, B1, B2, C1, or C2 may be used to replace one of the other approved means of long-range navigation such as dual INS or dual Omega. A single GPS installation with these classes of equipment which provides RAIM for integrity monitoring may also be used on short oceanic routes which have only required one means of long-range navigation.

4.16.3.2 GPS domestic en route and terminal IFR operations can be conducted as soon as the proper avionics systems are installed provided the general requirements of this NOTAM are met. The avionics necessary to receive all of the ground-based facilities appropriate for the route to the destination airport and any required alternate airport must be installed and operational. The ground-based facilities necessary for these routes must also be operational.

4.16.3.3 The GPS Approach Overlay Program permits pilots to use GPS avionics under IFR for flying existing instrument approach procedures, except localizer (LOC), localizer directional aid (LDA) and simplified directional facility (SDF) procedures. In the future, stand alone GPS approaches will be developed and introduced into the NAS.

4.16.3.4 GPS IFR approach operations can be conducted in accordance with Phase I, Phase II or Phase III of the GPS Approach Overlay Program, as appropriate, as soon as the proper avionics systems are installed and the following requirements are met. This general approval to use GPS to fly instrument approaches is limited to U.S. airspace. The use of GPS in any other airspace must be expressly authorized by the Administrator. GPS instrument approach operations outside the United States must also be authorized by the appropriate sovereign authority.

4.16.4. Equipment and Database Requirements.

4.16.4.1 Authorization to fly approaches under IFR using GPS avionics systems require that:

4.16.4.1.1 A pilot use GPS avionics with TSO C-129 authorization in class A1, B1, B3, C1, or C3; and

4.16.4.1.2 The specific approach procedure to be flown must be retrievable from the airborne navigation database associated with the TSO C 129 equipment.

4.16.4.1.2 NOTE: GPS avionics systems installed and operated in accordance with the AFS/AIR guidance dated July 20, 1992 are not approved for "overlay" program phase II or III.

4.16.5 Phases of the Approach Overlay Program.

4.16.5.1. Phase I - Under Phase I, GPS avionics can be used as the IFR flight guidance system for approaches as long as the ground-based navaid(s) required by the published procedure is operational and actively monitored while conducting the approach. Approach clearances must be requested and approved using the published title of the existing approach procedure such as "VOR Rwy 24".

4.16.5.2. Under Phase II, GPS avionics can be used as the IFR flight guidance system for an approach without actively monitoring the ground-based navaid(s) which defines the approach. However, the ground-based navaids must be operational. In addition, the related avionics must be installed and operational but need not be turned-on during the approach. Approaches must be requested and approved using the published title of the existing approach procedure such as "VOR Rwy 24".

4.16.5.3. Phase III - Phase III begins when FAR Part-97 instrument approach procedures are re-titled "GPS or VOR Rwy 24". When this Phase begins, ground-based navaids are not required to be operational and the associated aircraft avionics need not be installed, operational, turned-on or monitored. GPS approaches will be requested and approved using the GPS title, such as "GPS Rwy 24". Pending FAA's publication of FAR Part-97 GPS approaches, stand alone GPS approaches will be developed and authorized on a case-by-case basis.

4.16.6 In each Phase, any required alternate airport must have an approved instrument approach procedure, other than GPS or LORAN-C, which is anticipated to be operational and available at the estimated time of arrival.

GPS IFR EQUIPMENT CLASSES/CATAGORIES

TSO-C129

Equipmt. Class	RAIM	INT. NAV SYS TO PROV. RAIM EQUIV.	OCEANIC	ENROUTE	TERMINAL	NON-PRECISION APPROACH CAPABLE
Class A - GPS sensor and navigation capability.						
A1	yes		yes	yes	yes	yes
A2	yes		yes	yes	yes	no
Class B - GPS sensor data to an integrated navigation system (i.e. FMS, multi-sensor navigation system, etc.)						
B1	yes		yes	yes	yes	yes
B2	yes		yes	yes	yes	no
B3		yes	yes	yes	yes	yes
B4		yes	yes	yes	yes	no
Class C - GPS sensor data to an integrated nav. system (as in Class B) which provides enhanced guidance to an autopilot, or flight director, to reduce flight tech. errors. Limited to FAR 121 or equivalent criteria.						
C1	yes		yes	yes	yes	yes
C2	yes		yes	yes	yes	no

GPS IFR EQUIPMENT CLASSES/CATAGORIES—Continued

TSO-C129

Equipmt. Class	RAIM	INT. NAV SYS TO PROV. RAIM EQUIV.	OCEANIC	ENROUTE	TERMINAL	NON-PRECISION APPROACH CAPABLE
C3		yes	yes	yes	yes	yes
C4		yes	yes	yes	yes	no

5. NAVAID IDENTIFIER REMOVAL DURING MAINTENANCE

5.1 During periods of routine or emergency maintenance, coded identification (or code and voice, where applicable) is removed from certain FAA navaids. Removal of the identification serves as warning to pilots that the facility is officially off the air for tune-up or repair and may be unreliable even though intermittent or constant signals are received.

Note.—During periods of maintenance VHF ranges may radiate a T-E-S-T code (- . ... -).

6. USER REPORTS ON NAVAID PERFORMANCE

6.1 Users of the National Airspace System can render valuable assistance in the early correction of navaid malfunctions by reporting their observation of undesirable performance. Although NAVAID's are monitored by electronic detectors adverse effects of electronic interference, new obstructions or changes in terrain near the NAVAID can exist without detection by the ground monitors. Some of the characteristics of malfunction or deteriorating performance which should be reported are: Erratic course or bearing indications; intermittent, or full, flag alarm; garbled, missing or obviously improper coded identification; poor quality communications reception; or, in the case of frequency interference, an audible hum or tone accompanying radio communications or navaid identification.

6.2 Reporters should identify the NAVAID, location of the aircraft, time of the observation, type of aircraft and describe the condition observed; the type of receivers in use will also be useful information. Reports can be made in any of the following ways:

6.2.1 Immediately, by radio communication to the controlling Air Route Traffic Control Center, Control Tower, or Flight Service Station. This provides the quickest result.

6.2.2 By telephone to the nearest FAA facility.

6.2.3 By FAA Form 8000-7, Safety Improvement Report, a postage-paid card designed for this purpose. These cards may be obtained at FAA Flight Service Stations, General Aviation District Offices, Flight Standards District Offices, and General Aviation Fixed Base Operations.

6.3 In aircraft that have more than one receiver, there are many combinations of possible interference between units. This can cause either erroneous navigation indications or, complete or partial blanking out of the communications. Pilots should be familiar enough with the radio installation of particular airplanes they fly to recognize this type of interference.

7. RADIO COMMUNICATIONS PHRASEOLOGY AND TECHNIQUES

7.1 General

7.1.1 Radio communications are a critical link in the ATC system. The link can be a strong bond between pilot and controller — or it can be broken with surprising speed and disastrous results. Discussion herein provides basic procedures for new pilots and also highlights safe operating concepts for all pilots.

7.1.2 The single, most important thought in pilot-controller communications is understanding. It is essential, therefore, that pilots acknowledge each radio communication with ATC by using the appropriate aircraft call sign. Brevity is important, and contacts should be kept as brief as possible, but the controller must know what you want to do before he can properly carry out his control duties. And you, the pilot, must know exactly what he wants you to do. Since concise phraseology may not always be adequate, use whatever words are necessary to get your message across. Pilots are to maintain vigilance in monitoring air traffic control radio communications frequencies for potential traffic conflicts with their aircraft especially when operating on an active runway and/or when conducting a final approach to landing.

7.1.3 All pilots will find the Pilot/Controller Glossary very helpful in learning what certain words or phrases mean. Good phraseology enhances safety and is the mark of a professional pilot. Jargon, chatter and "CB" slang have no place in ATC communications. The Pilot/Controller Glossary is the same glossary used in the ATC controller's handbook. We recommend that it be studied and reviewed from time to time to sharpen your communication skills.

7.2 Radio Technique

7.2.1 *Listen* before you transmit. Many times you can get the information you want through ATIS or by monitoring the frequency. Except for a few situations where some frequency overlap occurs, if you hear someone else talking, the keying of your transmitter will be futile and you will probably jam their receivers causing them to repeat their call. If you have just changed frequency, pause for your receiver to tune, listen and make sure the frequency is clear.

7.2.2 *Think* before keying your transmitter. Know what you want to say and if it is lengthy, e.g., a flight plan or IFR position report, jot it down. (But do not lock your head in the cockpit.)

7.2.3 The microphone should be very close to your lips and after pressing the mike button, a slight pause may be necessary to be sure the first word is transmitted. Speak in a normal conversational tone.

7.2.4 When you release the button, wait a few seconds before calling again. The controller or FSS specialist may be jotting down your number, looking for your flight plan, transmitting on a different frequency, or selecting his transmitter to your frequency.

7.2.5 Be alert to the sounds or lack of sounds in your receiver. Check your volume, recheck your frequency and make sure that your microphone is not stuck in the transmit position. Frequency blockage can, and has, occurred for extended periods of time due to unintentional transmitter operation. This type of interference is commonly referred to as a "stuck mike," and controllers may refer to it in this manner when attempting to assign an alternate frequency. If the assigned frequency is completely blocked by this type of interference, use the procedures described in RAC-3, En Route IFR, Radio Frequency Outage, to establish/reestablish communications with ATC.

7.2.6 Be sure that you are within the performance range of your radio equipment and the ground station equipment. Remote radio sites do not always transmit and receive on all of a facilities available frequencies, particularly with regard to VOR sites where you can hear but not reach a ground station's receiver. Remember that higher altitude increases the range of VHF "line of sight" communications.

7.3 Use of Aircraft Call Signs.

7.3.1 Improper use of call signs can result in pilots executing a clearance intended for another aircraft. *Call signs should never be abbreviated on an initial contact or at any time when other aircraft call signs have similar numbers/sounds or identical letters/numbers,* (e.g., Cessna 6132F, Cessna 1622F, Baron 123F, Cherokee 7732F, etc.). As an example, assume that a controller issues an approach clearance to an aircraft at the bottom of a holding stack and an aircraft with a similar call sign (at the top of the stack) acknowledges the clearance with the last two or three numbers of his call sign. If the aircraft at the bottom of the stack did not hear the clearance and intervene, flight safety would be affected, and there would be no reason for either the controller or pilot to suspect that anything is wrong. This kind of "human factors" error can strike swiftly and is extremely difficult to rectify. Pilots, therefore, must be certain that aircraft identification is complete and clearly identified before taking action on an ATC clearance. ATC specialists will not abbreviate call signs of air carrier or other civil aircraft having authorized call signs. ATC specialists may initiate abbreviated call signs of other aircraft by using the prefix and the last three digits/letters of the aircraft identification after communications are established. The pilot may use the abbreviated call sign in subsequent contacts with the ATC specialist. When aware of similar/identical call signs, ATC specialists will take action to minimize errors by emphasizing certain numbers/letters, by repeating the entire call sign, repeating the prefix, or by asking pilots to use a different call sign temporarily. Pilots should use the phrase "Verify clearance for (your complete call sign)" if doubt exists concerning proper identity.

7.3.2 Civil aircraft pilots should state the aircraft type, model or manufacturer's name followed by the digits/letters of the registration number. When the aircraft manufacturer's name or model is stated, the prefix "N" is dropped.

Examples:

"BONANZA SIX FIVE FIVE GOLF," "DOUGLAS ONE ONE ZERO," "BREEZY SIX ONE THREE ROMEO EXPERIMENTAL" (Omit "Experimental" after initial contact).

7.3.3 Air Taxi or other commercial operators not having FAA authorized call signs should prefix their normal identification with the phonetic word "Tango." For example, Tango Aztec Two Four Six Four Alpha.

7.3.4 Air carriers and commuter air carriers having FAA authorized call signs should identify themselves by stating the complete call sign, using group form for the numbers.

Examples:

UNITED TWENTY-FIVE, MIDWEST COMMUTER SEVEN ELEVEN.

7.3.5 Military aircraft use a variety of systems including serial numbers, word call signs and combinations of letter/numbers. Examples include Army Copter 48931, Air Force 61782, REACH 31792, Pat 157, Air Evac 17652, Navy Golf Alpha Kilo 21, Marine 4 Charlie 36, etc.

7.3.6 Air Ambulance Flights. Because of the priority afforded air ambulance flights in the ATC system, extreme discretion is necessary when using the term "LIFEGUARD." It is only intended for those missions of an urgent medical nature and to be utilized only for that portion of the flight requiring expeditious handling. When requested by the pilot, necessary notification to expedite ground handling of patients, etc., is provided by ATC; however, when possible, this information should be passed in advance through non-ATC communications systems.

7.3.6.1 Civilian air ambulance flights responding to medical emergencies (first call to an accident scene, carrying patients, organ donors, organs, or other urgently needed lifesaving medical material) will be expedited by ATC when necessary. When expeditious handling is necessary, add the word "LIFEGUARD" in the remarks section of the flight plan. In radio communications, use the call sign "LIFEGUARD" followed by the aircraft registration letters/numbers.

7.3.6.2. Similar provisions have been made for the use of "Air-Evac" and "Med-Evac" by military air ambulance flights, except that these military flights will receive priority only when specifically requested.

Example:

LIFEGUARD TWO SIX FOUR SIX.

7.3.6.3. Air carrier and air taxi flights responding to medical emergencies will also be expedited by ATC when necessary. The nature of these medical emergency flights usually concerns the transportation of urgently needed lifesaving medical materials or vital organs. IT IS IMPERATIVE THAT THE COMPANY/PILOT DETERMINE, BY THE NATURE/URGENCY OF THE SPECIFIC MEDICAL CARGO, IF PRIORITY ATC ASSISTANCE IS REQUIRED. Pilots shall ensure that the word "LIFEGUARD" is included in the remarks section of the flight plan and use the call sign "LIFEGUARD" followed by the company name and flight number, for all transmissions when expeditious handling is required. It is important for ATC to be aware of "LIFEGUARD" status, and it is the pilot's responsibility to ensure that this information is provided to ATC.

Example:

LIFEGUARD DELTA THIRTY-SEVEN.

7.3.7 Student Pilots Radio Identification. The FAA desires to help the student pilot in acquiring sufficient practical experience in the environment in which he will be required to operate. To receive additional assistance while operating in areas of concentrated air traffic, a student pilot need only identify himself as a student pilot during his initial call to an FAA radio facility. For instance, "Dayton Tower, this is Fleetwing 1234, Student Pilot." This special identification will alert FAA air traffic control personnel and enable them to provide the student pilot with such extra assistance and consideration as he may need. This procedure is not mandatory.

7.4 Description of Interchange or Leased Aircraft

7.4.1 Controllers issue traffic information based on familiarity with airline equipment and color/markings. When an air carrier dispatches a flight using another company's equipment and the pilot does not advise the terminal ATC facility, the possible confusion in aircraft identification can compromise safety.

7.4.2 Pilot flying an "interchange" or "leased" aircraft not bearing the colors/markings of the company operating the aircraft should inform the terminal ATC facility on first contact the name of the operating company and trip number, followed by the company name as displayed on the aircraft, and aircraft type.

Example:

Air Cal 311, United (Interchange/Lease), Boeing 727.

7.5 Use of Ground Station Call Signs

Pilots, when calling a ground station, should begin with the name of the facility being called followed by the type of the facility being called, as indicated in the following examples.

Examples are self-explanatory:

Airport Unicom	"Shannon Unicom"
FAA Flight Service Station	"Shannon Radio"
FAA Flight Service Station (En Route Flight Advisory Service (Weather).	"Seattle Flight Watch"
Airport Traffic Control Tower	"Augusta Tower"
Clearance Delivery Position (IFR).	"Dallas Clearance Delivery"
Ground Control Position in Tower.	"Miami Ground"
Radar or Nonradar Approach Control Position.	"Oklahoma City Approach"
Radar Departure Control Position.	"St. Louis Departure"
FAA Air Route Traffic Control Center.	"Washington Center"

7.6 Radio Communications Phraseology

7.6.1 Phonetic Alphabet

The International Civil Aviation Organization (ICAO) phonetic alphabet is used by FAA personnel when communications conditions are such that the information cannot be readily received without their use. Air traffic control facilities may also request pilots to use phonetic letter equivalents when aircraft with similar sounding identifications are receiving communications on the same frequency. Pilots should use the phonetic alphabet when identifying their aircraft during initial contact with air traffic control facilities. Additionally use the phonetic equivalents for single letters and to spell out groups of letters or difficult words during adverse communications conditions.

CHARACTER	MORSE CODE	TELEPHONY	PHONIC (PRONUNCIATION)
A	.-	Alfa	(AL-FAH)
B	-...	Bravo	(BRAH-VOH)
C	-.-.	Charlie	(CHAR-LEE) or (SHAR-LEE)
D	-..	Delta	(DELL-TAH)
E	.	Echo	(ECK-OH)
F	..-.	Foxtrot	(FOKS-TROT)
G	--.	Golf	(GOLF)
H	....	Hotel	(HOH-TEL)
I	..	India	IN-DEE-AH)
J	.---	Juliett	(JEW-LEE-ETT)
K	-.-	Kilo	(KEY-LOH)
L	.-..	Lima	(LEE-MAH)
M	--	Mike	(MIKE)
N	-.	November	(NO-VEM-BER)
O	---	Oscar	(OSS-CAH)
P	.--.	Papa	(PAH-PAH)
Q	--.-	Quebec	(KEH-BECK)
R	.-.	Romeo	(ROW-ME-OH)
S	...	Sierra	(SEE-AIR-RAH)
T	-	Tango	(TANG-GO)
U	..-	Uniform	(YOU-NEE-FORM) or (OO-NEE-FORM)
V	...-	Victor	(VIK-TAH)
W	.--	Whiskey	(WISS-KEY)
X	-..-	Xray	(ECKS-RAY)
Y	-.--	Yankee	(YANG-KEY)
Z	--..	Zulu	(ZOO-LOO)
1	.----	One	(WUN)

CHARACTER	MORSE CODE	TELEPHONY	PHONIC (PRONUNCIATION)
2	..---	Two	(TOO)
3	...--	Three	(TREE)
4	....-	Four	(FOW-ER)
5	.....	Five	(FIFE)
6	-....	Six	(SIX)
7	--...	Seven	(SEV-EN)
8	---..	Eight	(AIT)
9	----.	Nine	(NIN-ER)
0	-----	Zero	(ZEE-RO)

7.6.2 *Figures*

7.6.2.1 Figures indicating hundred and thousands in round number, as for ceiling heights, and upper wind levels up to 9900 shall be spoken in accordance with the following:

Examples:

500 .... FIVE HUNDRED
54,500 .... FOUR THOUSAND FIVE HUNDRED

7.6.2.2 Numbers above 9900 shall be spoken by separating the digits preceding the word "thousand."

Examples:

10,000 .... ONE ZERO THOUSAND
13,500 ...... ONE THREE THOUSAND FIVE HUNDRED

7.6.2.3 Transmit airway or jet route numbers as follows:

Examples:

V12 .... VICTOR TWELVE
J533 .... J FIVE THIRTY THREE

7.6.2.4 All other numbers shall be transmitted by pronouncing each digit.

Example:

10 .... ONE ZERO

7.6.2.5 When a radio frequency contains a decimal point, the decimal point is spoken as "Point."

Examples:

122.1 .... ONE TWO TWO POINT ONE

(ICAO Procedures require the decimal point be spoken as "DECIMAL" The FAA will honor such usage by military aircraft and all other aircraft required to use ICAO Procedures.)

7.6.3 Altitudes and Flight Levels

7.6.3.1 Up to but not including 18,000' MSL — by stating the separate digits of the thousands, plus the hundreds.

Examples:

12,000 .... ONE TWO THOUSAND
12,500 .... ONE TWO THOUSAND FIVE HUNDRED

7.6.3.2 At and above 18,000' MSL (FL 180) by stating the words "flight level" followed by the separated digits of the flight level.

Example:

190 .... FLIGHT LEVEL ONE NINER ZERO

7.6.4 Directions

The three digits of a magnetic course, bearing, heading or wind direction, should always be magnetic. The word "true" must be added when it applies.

Examples:

(magnetic course) 005 .... ZERO ZERO FIVE
(true course) 050 .... ZERO FIVE ZERO TRUE
(magnetic bearing) 360 .... THREE SIX ZERO
(magnetic heading) 100 .... ONE ZERO ZERO
(wind direction) 220 .... TWO TWO ZERO

7.6.5 Speeds

The separate digits of the speed are to be followed by the word 'knots' except that controllers may omit the word "knots" when using speed adjustment procedures (e.g., "Reduce/Increase Speed To Two Five Zero").

Examples:

250 .... TWO FIVE ZERO KNOTS
190 .... ONE NINER ZERO KNOTS

The separate digits of the mach number are to be preceded by the word "MACH."

Examples:

1.5 .... MACH ONE POINT FIVE
.64 .... MACH POINT SIX FOUR
.7 .... MACH POINT SEVEN

7.6.6 Time

7.6.6.1 FAA uses Coordinated Universal Time (UTC) for all operations. The term "Zulu" is used when ATC procedures require a reference to UTC.

Example:

0920 .... ZERO NINER TWO ZERO ZULU

To Convert From:	To Coordinated Universal Time:
Eastern Standard Time	Add 5 hours*
Central Standard Time	Add 6 hours*
Mountain Standard Time	Add 7 hours*
Pacific Standard Time	Add 8 hours*
Alaska Standard Time	Add 9 hours*
Hawaii Standard Time	Add 10 hours*

*For Daylight Time subtract 1 hour.

7.6.6.2 The 24-hour clock system is used in radiotelephone transmissions. The hour is indicated by the first two figures and the minutes by the last two figures.

Examples:

0000 .... ZERO ZERO ZERO ZERO
0920 .... ZERO NINER TWO ZERO

7.6.6.3 Time may be stated in minutes only (two figures) in radio telephone communications when no misunderstanding is likely to occur.

7.6.6.4 Current time in use at a station is stated in the nearest quarter minute in order that pilots may use this information for time checks. Fractions of a quarter minute or more, but less than eight seconds more, are stated as the preceding quarter minute; fractions of a quarter minute of eight seconds or more are stated as the succeeding quarter minute.

Examples: Time

0929:05 .... TIME, ZERO NINER TWO NINER
0929:10 .... TIME, ZERO NINER TWO NINER AND ONE-QUARTER

7.7 Procedures for Ground Station Contact

7.7.1 Initial Contact.

7.7.1.1 The term "initial contact" or initial call up" means the first radio call you make to a given facility, or the first call to a different controller/FSS specialist within a facility. Use the following format: (a) name of facility being called, (b) your full aircraft identification as filed in the flight plan or as discussed under aircraft call signs, (c) type of message to follow or your request if it is short, and (d) the word "Over", if required.

Examples:

"NEW YORK RADIO, MOONEY THREE ONE ONE ECHO." "COLUMBIA GROUND CONTROL, CESSNA THREE ONE SIX ZERO FOXTROT, IFR MEMPHIS."

Example:

"MIAMI CENTER BARON FIVE SIX THREE HOTEL, REQUEST VFR TRAFFIC ADVISORIES."

7.7.1.2 Many FSSs are equipped with ROCs and can transmit on the same frequency at more than one location. The frequencies available at specific locations are indicated on charts above FSS communications boxes. To enable the specialist to utilize the correct transmitter, advise the location and frequency on which you expect a reply.

Example:

St. Louis FSS can transmit on frequency 122.3 at either Farmington, MO, or Decatur, IL. If you are in the vicinity of Decatur, your callup should be "SAINT LOUIS RADIO, PIPER SIX NINER SIX YANKEE, RECEIVING DECATUR ONE TWO TWO POINT THREE."

7.7.1.3 If radio reception is reasonably assured, inclusion of your request, your position or altitude, the phrase "Have numbers" or "Information Charlie received" (for ATIS) in the initial contact helps decrease radio frequency congestion. Use discretion and do not overload the controller with information he does not need. When you do not get a response from the ground station, recheck your radios or use another transmitter and keep the next contact short.

Example:

"ATLANTA CENTER, DUKE FOUR ONE ROMEO, REQUEST VFR TRAFFIC ADVISORIES, TWENTY NORTHWEST ROME, SEVEN THOUSAND FIVE HUNDRED, OVER."

7.7.2 Initial contact when your transmitting and receiving frequencies are different.

7.7.2.1 If you are attempting to establish contact with a ground station and you are receiving on a different frequency than that transmitted, indicate the VOR name or the frequency on which you expect a reply. Most FSSs and control facilities can transmit on several VOR stations in the area. Use the appropriate FSS call sign as indicated on charts.

Example:

New York FSS transmits on the Kennedy, Deer Park and Calverton VORTACs. If you are in the Calverton area, your callup should be "New York Radio, Cessna Three One Six Zero Foxtrot, Receiving Riverhead VOR, Over."

7.7.2.2 If the chart indicates FSS frequencies above the VORTAC or in FSS communications boxes, transmit or receive on those frequencies nearest your location.

7.7.2.3 When unable to establish contact and you wish to call any ground station, use the phrase "any radio (tower) (station), give Cessna Three One Six Zero Foxtrot a call on (frequency) or (VOR)." If an emergency exists or you need assistance, so state.

7.7.3 Subsequent Contacts and Responses to Call up from a Ground Facility. Use the same format as used for initial contact except you should state your message or request with the call up in one transmission. The ground station name and the word "Over" may be omitted if the message requires an obvious reply and there is no possibility for misunderstandings. You should acknowledge all callups or clearances unless the controller of FSS specialist advises otherwise. There are some occasions when the controller must issue time-critical instructions to other aircraft and he may be in a position to observe your response, either visually or on radar. If the situation demands your response, take appropriate action or immediately advise the facility of any problem. Acknowledge with your aircraft identification and one of the words "Wilco, Roger, Affirmative, Negative" or other appropriate remarks; e.g., "Piper Two One Four Lima, Roger." If you have been receiving services, e.g., VFR traffic advisories and you are leaving the area or changing frequencies, advise the ATC facility and terminate contact.

7.7.4 Acknowledgement of Frequency Changes.

7.7.4.1 When advised by ATC to change frequencies, acknowledge the instruction. If you select the new frequency without an ackowledgement, the controller's workload is increased because he has no way of knowing whether you received the instruction or have had radio communications failure.

7.7.4.2 At times, a controller/specialist may be working a sector with multiple frequency assignments. In order to eliminate unnecessary verbiage and to free the controller/specialist for higher priority transmissions, the controller/specialist may request the pilot "(Identification), change to my frequency 123.4." This phrase should alert the pilot that he is only changing frequencies, not controller/specialist, and that initial call up phraseology may be abbreviated.

EXAMPLE:

"United 222 on 123.4."

7.7.5 Compliance with Frequency Changes. When instructed by ATC to change frequencies, select the new frequency as soon as possible unless instructed to make the change at a specific time, fix, or altitude. A delay in making the change could result in an untimely receipt of important information. If you are instructed to make the frequency change at a specific time, fix, or altitude, monitor the frequency you are on until reaching the specified time, fix, or altitudes unless instructed otherwise by ATC.

8. COMMUNICATIONS FOR VFR FLIGHTS

8.1 FAA Flight Service Stations (FSSs) and Supplemental Weather Service Locations (SWSLs) are allocated frequencies for different functions; for example, 122.0 MHz is assigned as the En Route Flight Advisory Service frequency at selected FSSs. In addition, certain FSSs provide Local Airport Advisory on 123.6 MHz. Frequencies are listed in the Airport/Facility Directory. If you are in doubt as to what frequency to use, 122.2 MHz is assigned to the majority of FSSs as a common en route simplex frequency.

Note.—In order to expedite communications, state the frequency being used and the aircraft location during initial call-up.

Example:
"DAYTON RADIO, THIS IS N12345 ON 122.2 MHz OVER SPRINGFIELD VOR, OVER."

8.1.1 Certain VOR voice channels are being utilized for recorded broadcasts, i.e., ATIS, HIWAS, etc. These services and appropriate frequencies are listed in the Airport/Facility Directory. On VFR flights, pilots are urged to monitor these frequencies. When in contact with a control facility, notify the controller if you plan to leave the frequency to monitor these broadcasts.

8.2 Hazardous Area Reporting Service

8.2.1 Selected Flight Service Stations provide flight monitoring where regularly traveled VFR routes cross large bodies of water, swamps, and mountains, for the purpose of expeditiously alerting Search and Rescue facilities when required.

8.2.1.1 When requesting the service either in person, by telephone or by radio, pilots should ask for the service desired and be prepared to give the following information — type of aircraft, altitude, indicated airspeed, present position, route of flight, heading.

8.2.1.2 Radio contacts are desired at least every 10 minutes. If contact is lost for more than 15 minutes, Search and Rescue will be alerted. Pilots are responsible for cancelling their request for service when they are outside the service area boundary. Pilots experiencing two-way radio failure are expected to land as soon as practicable and cancel their request for the service. The illustration in Appendix Two includes the areas and the FSS facilities involved in this program.

8.2.2 Long Island Sound Reporting Service (LIRS)

The New York and Bridgeport AFSSs provide Long Island Sound Reporting service on request for aircraft traversing Long Island Sound.

8.2.2.1 When requesting the service pilots should ask for SOUND REPORTING SERVICE and should be prepared to provide the following appropriate information: (1) Type and color of aircraft, (2) The specific route and altitude across the sound including the shore crossing point, (3) The overwater crossing time, (4) Number of persons on board, (5) True air speed.

8.2.2.2 Radio contacts are desired at least every 10 minutes, however, for flights of shorter duration a midsound report is requested. If contact is lost for more than 15 minutes, Search and Rescue will be alerted. Pilots are responsible for cancelling their request for the Long Island Sound Reporting Service when outside the service area boundary. Aircraft as soon as practicable and cancel their request for the service.

8.2.2.3 COMMUNICATIONS: Primary communications — pilot transmits 122.1 MHz and listens on the VOR frequency.

NEW YORK AFSS	
Hampton RCO	T122.6/R122.6 MHz
Calverton VORTAC	T117.2 MHz
Kennedy VORTAC	T115.9/R122.1 MHz
BRIDGEPORT AFSS	
Madison VORTAC	T110.4/R122.1 MHz
Groton VOR	T111.8/R122.1 MHz
Bridgeport VOR	T108.8/R122.1 MHz

8.2.3 Block Island Reporting Service (BIRS)

Within the Long Island Reporting Service, the New York FSS/IFSS also provides an additional service for aircraft operating between Montauk Point and Block Island. When requesting this service, pilots should ask for BLOCK ISLAND REPORTING SERVICE and should be prepared to provide the same flight information as that required for the Long Island Sound Reporting Service.

8.2.3.1 A minimum of three position reports are mandatory for this service. These are:

1. Report leaving Montauk Point or Block Island.
2. Midway report.
3. Report when over Montauk Point or Block Island at which time the pilot cancels the overwater service.

8.2.3.2 COMMUNICATIONS: Pilots are to transmit and receive on 122.6 MHz.

8.2.3.3 Pilots are advised that 122.6 MHz is a remote receiver located at the Hampton VORTAC site and designed to provide radio coverage between Hampton and Block Island. Flights proceeding beyond Block Island may contact the Bridgeport AFSS by transmitting on 122.1 MHz and listing on Groton VOR (TMU) frequency 111.8 MHz.

8.2.4 Cape Cod and Islands Radar Overwater Flight Following

In addition to normal VFR radar advisory service, traffic permitting, Otis Approach Control provides a radar overwater flight following service for aircraft traversing the Cape Code and adjacent Island area. Pilots desiring this service may contact Cape RAPCON on 118.2 MHz

8.2.4.1 Pilots requesting this service should be prepared to give the following information: (1) type and color of aircraft, (2) altitude, (3) position and heading, (4) route of flight, and (5) true airspeed.

8.2.4.2 For best radar coverage pilots are encouraged to fly at 1,500 feet MSL or above.

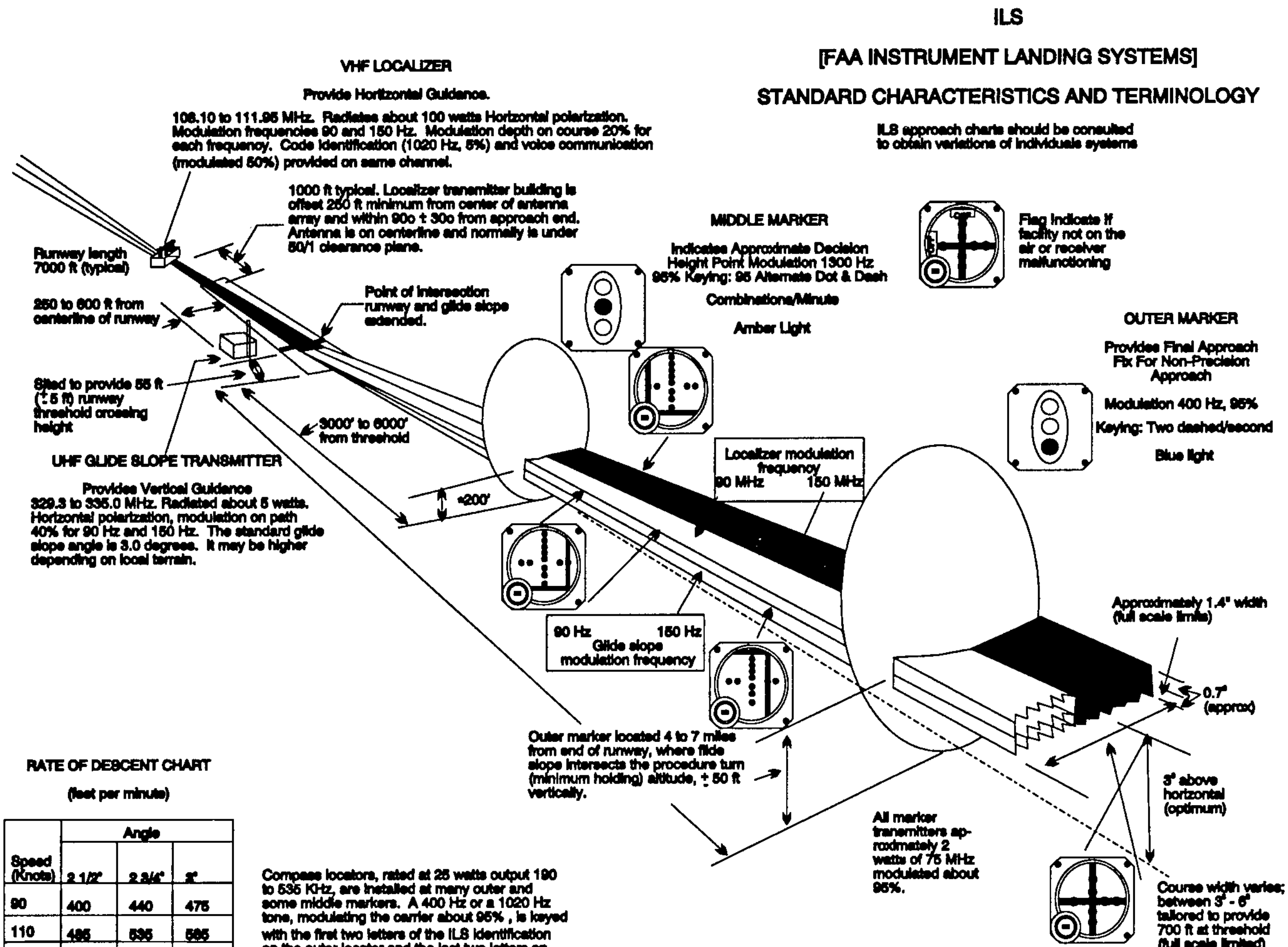
8.2.4.3 Pilots are responsible for cancelling their request for overwater flight following when they are over the mainland and/or outside the service area boundary.

9. OVER-WATER FLIGHTS RADIO PROCEDURE

9.1 Pilots should remember that there is a need to continuously guard the VHF emergency frequency 121.5 MHz when on long over-water flights, except when communications on other VHF channels, equipment limitations, or cockpit duties prevent simultaneous guarding of two channels. Guarding of 121.5 MHz is particularly critical when operating in proximity to flight information region (FIR) boundaries, for example, operations on

Route R220 between Anchorage and Tokyo, since it serves to facilitate communications with regard to aircraft which may experience in-flight emergencies, communications, or navigational difficulities. (Reference ICAO Annex 10, Vol II Paras 5.2.2.1.1.1 and 5.2.2.1.1.2.)

APPENDIX ONE



RATE OF DESCENT CHART

(feet per minute)

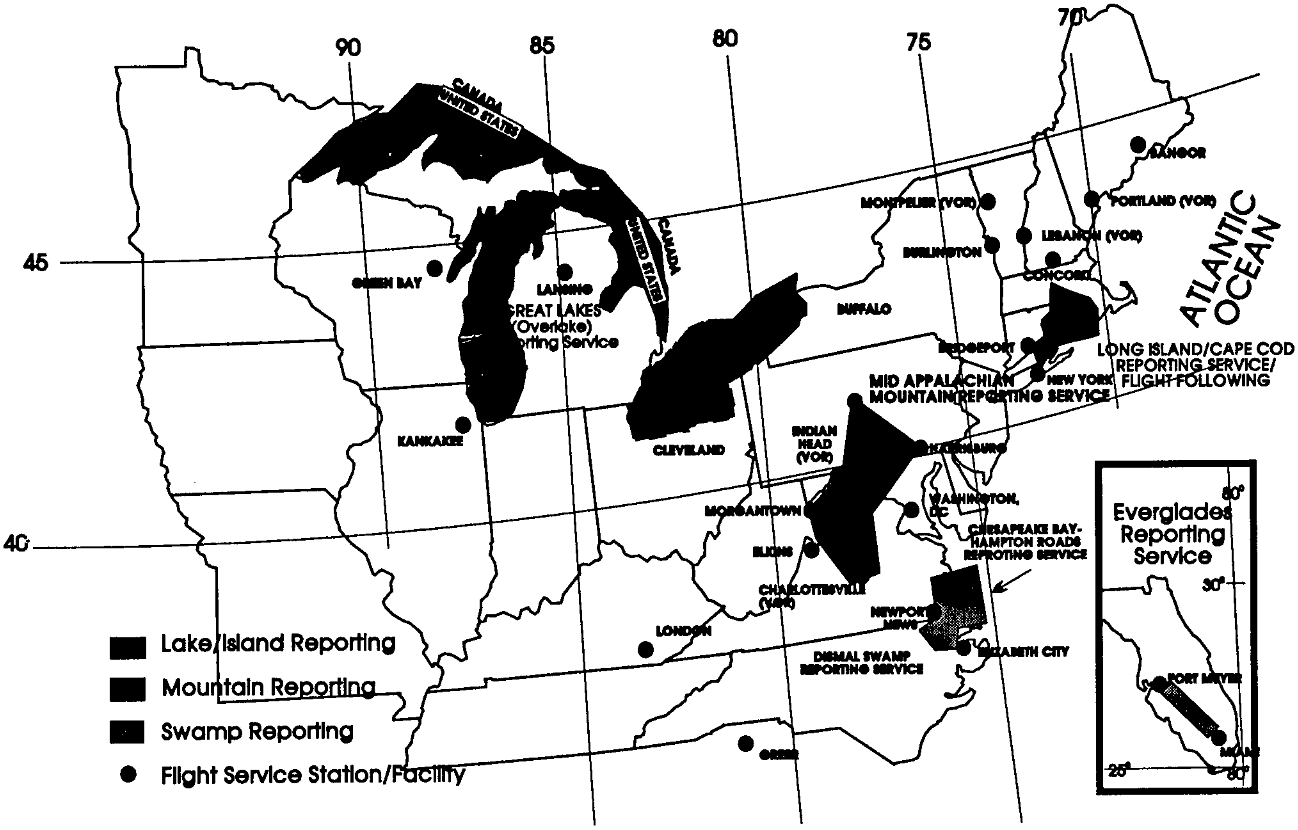
Speed (Knots)	Angle		
	2 1/2°	2 3/4°	3°
90	400	440	475
110	485	535	585
130	575	630	690
150	665	730	795
160	707	778	849

Compass locators, rated at 25 watts output 190 to 535 KHz, are installed at many outer and some middle markers. A 400 Hz or a 1020 Hz tone, modulating the carrier about 95% , is keyed with the first two letters of the ILS identification on the outer locator and the last two letters on the middle locator. At some locations, simultaneous voice transmissions from the control tower are provided, with appropriate reduction in identification percentage.

* Figures marked with asterisk are typical. Actual figures vary with deviations in distances to markders, glide angles and localizer widths.

APPENDIX TWO

HAZARDOUS AREA REPORTING SERVICE



APPENDIX THREE

Table 1. MLS Channeling

(Azimuth, Elevation, & Data)

CHANNEL NUMBER	FREQUENCY (MHz)	CHANNEL NUMBER	FREQUENCY (MHz)	CHANNEL NUMBER	FREQUENCY (MHz)	CHANNEL NUMBER	FREQUENCY (MHz)	CHANNEL NUMBER	FREQUENCY (MHz)
500	5031.0	540	5043.0	580	5055.0	620	5067.0	660	5079.0
501	5031.3	-	-	-	-	-	-	-	-
502	5031.6	-	-	-	-	-	-	-	-
503	5031.9	-	-	-	-	-	-	-	-
504	5032.2	-	-	-	-	-	-	-	-
505	5032.5	545	5044.5	585	5056.5	625	5068.5	665	5080.5
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
510	5034.0	550	5046.0	590	5058.0	630	5070.0	670	5982.0
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
515	5035.5	555	5047.5	595	5059.5	635	5071.5	675	5083.5
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
520	5037.0	560	5049.0	600	5061.0	640	5073.0	680	5085.0
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
525	5038.5	565	5050.5	605	5062.5	645	5074.5	685	5086.5
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
530	5040.0	570	5052.0	610	5064.0	650	5076.0	690	5088.0
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
535	5041.5	575	5053.5	615	5065.5	655	5077.5	695	5089.5
-	-	-	-	-	-	-	-	696	5089.8
-	-	-	-	-	-	-	-	697	5090.1
-	-	-	-	-	-	-	-	698	5090.4
-	-	-	-	-	-	-	-	699	5090.7

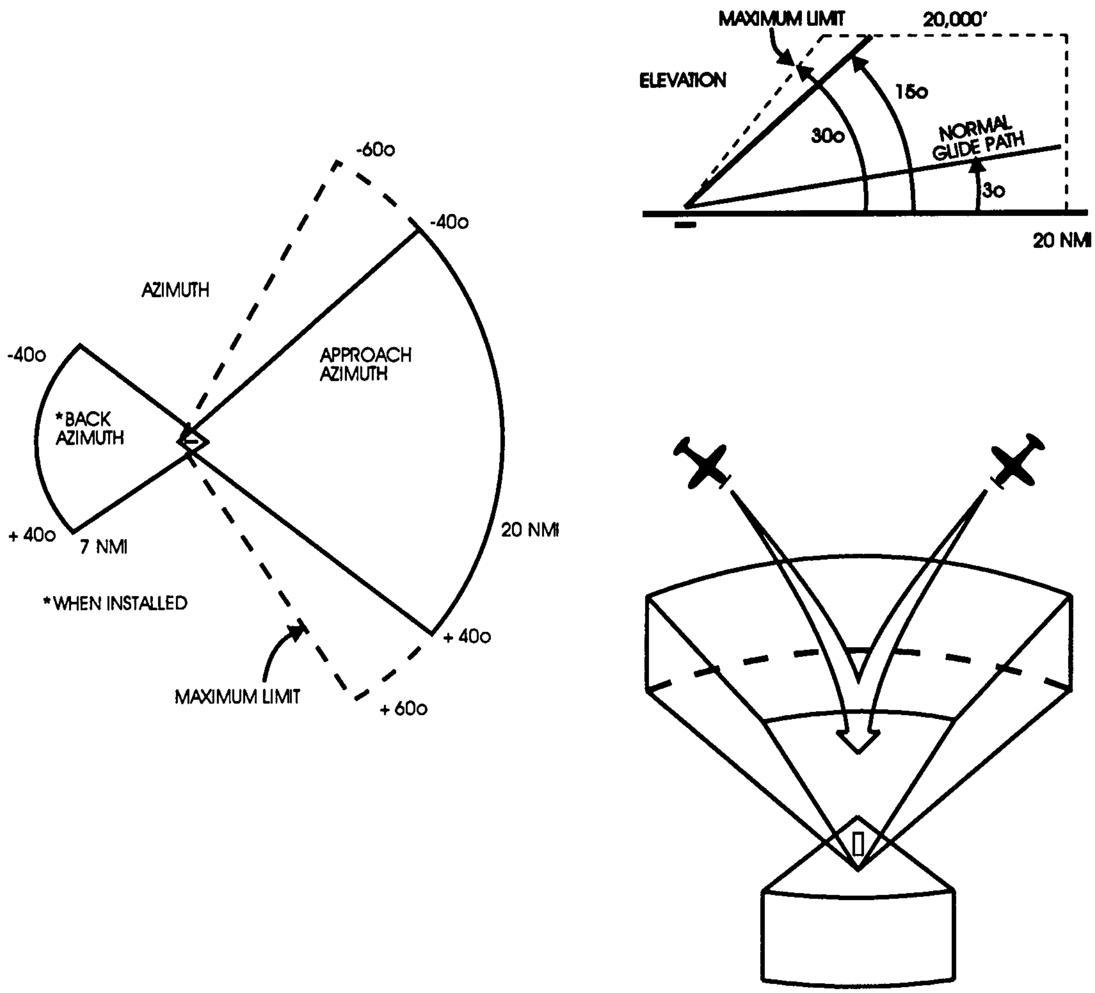
APPENDIX FOUR

Table 2. DME/P Channels, Frequencies, and Pairings

DME CHANNEL (NUMBER)	VHF CHANNEL (MHz)	C-BAND CHANNEL (MHz)	ANGLE CHANNEL (NUMBER)	INTERROGATOR FREQUENCY (MHz)	NON-PRECISION INTERROGATOR PULSE CODE (USEC)	PRECISION INTERROGATOR PULSE CODE (USEC)	TRANSPONDER FREQUENCY (MHz)	TRANSPONDER PULSE CODE (USEC)
1X	...	...	...	1025	12	...	962	12
1Y	...	...	...	1025	36	...	1088	30
2X	...	...	...	1026	12	...	963	12
2Y	...	...	...	1026	36	...	1089	30
3X	...	...	...	1027	12	...	964	12
3Y	...	...	...	1027	36	...	1090	30
4X	...	...	...	1028	12	...	965	12
4Y	...	...	...	1028	36	...	1091	30
5X	...	...	...	1029	12	...	966	12
5Y	...	...	...	1029	36	...	1092	30
6X	...	...	...	1030	12	...	967	12
6Y	...	...	...	1030	36	...	1093	30
7X	...	...	...	1031	12	...	968	12
7Y	...	...	...	1031	36	...	1094	30
8X	...	...	...	1032	12	...	969	12
8Y	...	...	...	1032	36	...	1095	30
9X	...	...	...	1033	12	...	970	12
9Y	...	...	...	1033	36	...	1096	30
10X	...	...	...	1034	12	...	971	12
10Y	...	...	...	1034	36	...	1097	30
11X	...	...	...	1035	12	...	972	12
11Y	...	...	...	1035	36	...	1098	30
12X	...	...	...	1036	12	...	973	12
12Y	...	...	...	1036	36	...	1099	30
13X	...	...	...	1037	12	...	974	12
13Y	...	...	...	1037	36	...	1100	30
14X	...	...	...	1038	12	...	975	12
14Y	...	...	...	1038	36	...	1101	30
15X	...	...	...	1039	12	...	976	12
15Y	...	...	...	1039	36	...	1102	30
16X	...	...	...	1040	12	...	977	12
16Y	...	...	...	1040	36	...	1103	30
17X	108.00	—	—	1041	12	—	978	12
17Y	108.05	5043.00	540	1041	36	42	1104	30
17Z	—	5043.30	541	1041	21	27	1104	15
18X	108.10	5031.00	500	1042	12	18	979	12
18W	—	5031.30	501	1042	24	33	979	24
18Y	108.15	5043.60	542	1042	36	42	1105	30
18Z	—	5043.90	543	1042	21	27	1105	15
19X	108.20	—	—	1043	12	—	980	12

APPENDIX FIVE

COVERAGE VOLUMES



U.S. AERONAUTICAL TELECOMMUNICATIONS SERVICES

(Services Available for Aircraft Engaged in International or Overseas Flight)

The aeronautical voice communication stations listed are available to and utilized by the U.S. Federal Aviation Administration Air Traffic Control Centers for air traffic control purposes.

The frequencies in use will depend upon the time of day or night and conditions which affect radio wave propagation. Voice communications handled on a single channel simplex basis (i.e., with the aircraft and the ground station using the same frequency for transmission and reception) unless otherwise noted in remarks.

The stations will remain on continuous watch for aircraft within their communications areas and, when practicable will transfer this watch to another station when the aircraft reaches the limit of the communications area.

Stations listed below which are designated "FAA" are operated by the U.S. Federal Aviation Administration. Stations designated "ARINC" are operated by Aeronautical Radio, Incorporated, 2551 Riva Road, Annapolis, Md. 21401, telephone number 410-266-4000; cable address ARINC Annapolis, Md. or HDQXGXA

STATION AND OPERATING AGENCY	RADIO CALL	TRANSMITTING FREQUENCIES	REMARKS
HONOLULU (ARINC)	Honolulu	2998 4666 6532 8903 11384 13300 17904 21985 kHz	Central West Pacific Network
		3467 5643 8867 13261 17904 kHz	South Pacific Network
		3413 5574 8843 13354 kHz	Central East Pacific One Network
		5547 11282 13288 kHz	Central East Pacific Two Network
		2932 5628 5667 6655 8915 8951 10048 11330 13273 13339 17946 21925 kHz	North Pacific Network
		3013 6640 11342 13348 17925 21964 kHz	Long-Distance Operations Control (LDOC) Service (phone patch). Communications are limited to operational control matters only. Public correspondence (personal messages) to/from crew or passengers can not be accepted.
		131.95 mHz	Extended range VHF. Coverage area includes tracks to mainland extending outward from HNL to approximately 400 NM. Range on other tracks is approximately 300 NM.
HONOLULU (FAA)	Honolulu Radio	122.6 122.2 #121.5 mHz	#Emergency. Frequency 122.1 also available for receiving only.
	Volmet	2863 6679 8828 13282 kHz	Broadcast at H+200-05 and H+230-35; Aerodrome Forecasts, HONOLULU, HILO, GUAM. SIGMET. Hourly Report, Honolulu, Hilo, Kahului, Guam.
			Broadcasts at H+05-10 and H+35-40; Hourly Reports, San Francisco, Los Angeles, Seattle, Portland, Sacramento, Ontario, Las Vegas. SIGEMT. Aerodrome forecasts, SAN FRANCISCO, SEATTLE, LOS ANGELES.
			Broadcasts at H+25-30 and H+55-00; Hourly Reports, Anchorage, Elmendorf, Fairbanks, Cold Bay, King Salmon, Vancouver. SIGMET. Aerodrome Forecasts, ANCHORAGE, FAIRBANKS, COLD BAY, VANCOUVER.
MIAMI (FAA)	Miami Radio	126.7 118.9 126.9 122.2 123.65 122.75 mHz	Local and Short Range.
		#121.5 mHz	#Emergency.
NEW YORK (FAA)	New York Radio (Volmet)	3485 6604 10051 13270 kHz	Broadcasts at H+00-05; Aerodrome Forecasts, DETROIT, CHICAGO, CLEVELAND. Hourly Reports, Detroit, Chicago, Cleveland, Niagara Falls, Milwaukee, Indianapolis.

STATION AND OPERATING AGENCY	RADIO CALL	TRANSMITTING FREQUENCIES	REMARKS
			Broadcasts at H+05-10; SIGMET (Oceanic—Ne York). Aerodrome Forecasts, BANGO PITTSBURGH, CHARLOTTE. Hourly R ports, Bangor, Pittsburgh, Windsor Locks, S Louis, Charlotte, Minneapolis.
			Broadcasts at H+10-15; Aerodrome Forecas NEW YORK, NEWARK, BOSTON. Hour reports, New York, Newark, Boston, Bal more, Philadelphia, Washington.
			Broadcasts at H+15-20; SIGMET (Oceanic- Miami/San Juan). Aerodrome Forecasts, BE MUDA, MIAMI, ATLANTA. Hourly Repor Bermuda, Miami, Nassau, Freeport, Tamp West Palm Beach, Atlanta.
			Broadcasts at H+30-35; Aerodrome Forecas NIAGARA FALLS, MILWAUKEE, INDIA APOLIS. Hourly Reports, Detroit, Chicag Cleveland, Niagara Falls, Milwaukee, India apolis.
			Broadcasts at H+35-40; SIGMET (Oceanic—Ne York). Aerodrome Forecasts, WINDSO LOCKS, ST. LOUIS. Hourly Reports, Bangc Pittsburgh, Windsor Locks, St. Louis, Cha lotte, Minneapolis.
			Broadcasts at H+40-45; Aerodrome Forecas BALTIMORE, PHILADELPHIA, WASHIN TON. Hourly Reports, New York, Newar Boston, Baltimore, Philadelphia, Washington.
			Broadcasts at H+45-50; SIGMET (Oceanic- Miami/San Juan). Aerodrome Forecasts, NA SAU, FREEPORT. Hourly Reports, Bermud Miami, Nassau, Freeport, Tampa, West Pal Beach, Atlanta.
NEW YORK (ARINC)	New York	3016 5598 8906 13306 17946 kHz	North Atlantic Family A Network
		2962 6628 8825 11309 13354 kHz	North Atlantic Family E Network
		2887 5550 6577 8918 11396 13297 17907 kHz	Caribbean Family A Network
		3455 5520 6586 8846 11330 17907 kHz	Caribbean Family B Network
		3494 6640 8933 11342 13330 17925 kHz	Long Distance Operations Control (LDOC) Ser ice (phone-patch). Communications are limit to operational control matters only. Publ cooorespondence (personal messages) to/fro crew or passengers can not be accepted.
		129.90 mHz	Extended range VHF. Coverage area includes C nadian Maritime Provinces, and oceanic rout to Bermuda and the Caribbean, from Bosto New York and Washington areas to approx mately 250 nautical miles from the east coast.
		130.7 mHz	Extended range VHF. Full period service is pr vided within most of the Gulf of Mexico. Al on routes between Miami and San Juan to distance of approximately 250 nautical mil from the Florida coast and within approx mately 250 nautical miles of San Juan. Dial-u station are provided when within approx mately 250 nautical miles of Nassau and Gra Turk Islands. To operate these, click mike (three times and wait one minute for station dial a New York operator.
SAN FRANCISCO (ARINC)	San Francisco	3413 5574 8843 10057 13354 17904 kHz	Central East Pacific One Network
		2869 5547 6673 11282 13288 kHz	Central East Pacific Two Network

STATION AND OPERATING AGENCY	RADIO CALL	TRANSMITTING FREQUENCIES	REMARKS
		3013 6640 11342 13348 17925 21964 kHz	Long-Distance Operations Control (LDOC) Service (phone patch). Communications are limited to operational control matters only. Public correspondence (personal messages) to/from crew or passengers can not be accepted.
		131.95 mHz	Extended range VHF. Coverage area includes tracks to HNL from SFO and LAX out to approximately 300 nautical miles from west coast.
		129.40 mHz	For en route communications for aircraft operating on Seattle/Anchorage/Routes/.
OAKLAND (FAA)	Oakland Radio	122.5 122.2 121.5 mHz	Emergency. Frequency 122.1 also available for receiving only.
SAN JUAN P.R. (FAA)	San Juan Radio	#121.5 122.2 126.7 123.65 #243.0 255.4 114.0 113.5 108.2 108.6 109.0 110.6 mHz	Unscheduled broadcast H+15 H+30 H+45 as appropriate for Weather and Military Activity Advisories, on 110.6, 109.0, 108.6, 108.2, 113.5, and 114.0. #Emergency. For frequencies 114.0, 113.5, 108.2, and 109.0 use 122.1 for transmissions to San Juan Radio. For frequency 108.6 use 123.6.

All users of the North Atlantic HF MWARA services should consult International NOTAMS and ICAO Regional Supplementary Procedures, Document 7030, for current procedures concerning the operational use of the North Atlantic HF families. At present, procedures for the distribution of HF communications traffic in the North Atlantic are: (a) All aircraft registered in the hemisphere west of 30W should use family alpha on the southern route and family bravo on the central and northern routes. (Southern routes are those which enter the New York, San Juan and Santa Maria FIRs. The central and northern routes comprise all others.) (b) All aircraft registered in the hemisphere east of 30W should use family alpha on the southern route and family charlie on the central and northern routes. (c) All aircraft should use family alpha on the southern route and family delta on the central and northern routes while outside the organized track system (OTS). (d) Aircraft registered in Australia will use families designated to aircraft registered east of 30W. Aircraft operating in the Anchorage Arctic CTA/FIR beyond line of sigh range of remote control VHF air/ground facilities operated from the Anchorage ACC, shall maintain communications with Cambridge Bay radio and a listening or SELCAL watch on HF frequencies of the North Atlantic D (NAT D) network (2971 kHz, 4675 kHz, 8891 kHz and 11279 kHz). Additionally, and in view of reported marginal reception of the Honolulu Pacific VOLMET broadcasts in that and adjacent Canadian airspace, Cambridge Bay radio can provide Anchorage and Fairbanks surface observations and terminal forecasts to flight crews on request.

SELECTIVE CALLING SYSTEM (SELCAL) FACILITIES AVAILABLE

Selective Calling (SELCAL) is a communication system which permits the selective calling of individual aircraft over radio-telephone channels from the ground station to properly equipped aircraft, so as to eliminate the need for the flight crew to constantly monitor the frequency in use.

Location	Operator	HF	VHF
Honolulu	ARINC	X	X
New York	ARINC	X	X
San Francisco	ARINC	X	X

AIRSPACE

GENERAL

1.1 General

There are two categories of airspace or airspace areas; regulatory and nonregulatory. Within these two categories, there are controlled, uncontrolled, special use, and other airspace area types. The categories and types of airspace are dictated by: (1) the complexity or density of aircraR movements; (2) the nature of the operations conducted within the airspace; and (3) the level of safety required; and (4) the national and public interest. It is important that pilots be familiar with the operational requirements for each of the various types or classes of airspace. Subsequent sections will cover each category and class in sufficient detail to facilitate understanding.

1.2 General Dimensions of Airspace Segments

Refer to Federal Aviation Regulations (FAR) for specific dimensions, exceptions, geographical areas covered, exclusions, specific transponder or equipment requirements, and flight operations.

1.3 Basic VFR Weather Minimums

No person may operate an aircraft under basic VFR when the flight visibility is less, or at a distance from clouds that is less,than that prescribed for the corresponding altitude and class of airspace. (See RAC 3.4, Appendix One for a tabular presentation of these rules).

Note.--Student pilots must comply with Part 61.89(a) (6) and (7).

1.4 VFR Cruising Altitudes and Flight Levels

VFR cruising altitudes and flight levels are presented in tabularform in RAC 3.4, Appendix Two.

2. CONTROLLED AIRSPACE

2.1 General

2.1.1 Controlled Airspace: A generic term that covers the different classification of airspace (Class A, Class B, Class C, Class D, and Class E airspace) and defined dimensions within which air traffic control service is provided to IFR flights and to VFR flights in accordance with the airspace classification. (See RAC 3.4, Appendix Three for Airspace Classes). Airspace classes are pronounced in the ICAO phonetics for clarification. The term "class" may be dropped when to airspace in pilot/controller communications.

2.1.2 IFR Requirements: IFR operations in any class of controlled airspace requires that a pilot must file an IFR flight plan and receive an appropriate ATC clearance.

2.13 IFR Separation: Standard IFR separation is provided to all aircraft operating under IFR in controlled airspace.

2.1.4 VFR Requirements: It is the responsibility of the pilot to insure that ATC clearance or radio communication requirements are met prior to entry into Class B, Class C, or Class D airspace. The pilot retains this responsibility when receiving ATCradar advisories. See FAR Part 91.

2.1.5 Traffic Advisories: Traffic advisories will be provided to all aircraft as the controller's work situation permits.

2.1.6 Safety Alerts: Safety Alerts are mandatory services and are provided to ALL aircraft. There are two types of Safety Alerts, Terrain/Obstruction Alert and Airaaft Conflict/Mode Intruder Alert.

2.1.7 Terrain/Obstruction Alert. A Terrain/Obstruction Alert is issued when, in the controller's judgment, an aircraft's altitude places it in unsafe proximity to terrain and/or obstructions.

2.1.8 Aircraft Conflict/Mode C Intruder Alert. An Aircraft Conflict/Mode C Intruder Alert is issued if the controller observes another aircraft which places it in an unsafe proximity. When feasible, the controller will offer the pilot an alternative course of action.

2.1.9 Ultralight Vehicles: No person may operate an ultralight vehicle within Class A, Class B, Class C, or Ciass D airspace or within the lateral boundaries of the surface area of Class E airspace designated for an airport unless that person has prior authorization from the ATC facility having jurisdiction over that airspace. See FAR Part 103.

2.1.10 Unmanned Free Balloons: Unless otherwise authorized by ATC, no person may operate an unmanned free balloon below 2,000 feet above the surface within the lateral boundaries of Class B, Class C, Class D, or Class E airspace designated for an airport. See FAR Part 101.

2.1.11 Parachute Jumps: No person may make a parachute jump, and no pilot in command may allow a parachute jump to be made from that aircraft, in or into Class A, Class B, Class C, or Class D airspace without, or in violation of, the terms of an ATC authorization issued by the ATC facility having jurisdiction over the airspace. See FAR Part 105.

2.2 Class A Airspace

2.2.1 Definition: Generally, that airspace from 18,000 feet MSL up to and including FL600, including the airspace overlying the waters within 12 nautical miles of the coast of the 48 contiguous States and Alaska; and designated international airspace beyond 12 nautical miles of the coast of the 48 contiguous States and Alaska within areas of domestic radio navigational signal or ATC radar coverage, and within which domestic procedures are applied.

2.2.2 Operating Rules and Pilot/Equipment Requirements: Unless otherwise authorized, all persons must operate their aircraft under IFR. See FAR Part 71.33 and Part 91.167 through Part 91.193.

2.2.3 Charts: Class A airspace is not specifically charted.

2.3 Class B Airspace

2.3.1 Definition: Generally, that airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports in terms of IFR operations or passenger enplanements. The configuration of each Class B airspace area is individually tailored and consists of a surface area and two or more layers (some

Class B airspace areas resemble upside-down wedding cakes), and is designed to contain all published instrument procedures once an aircraft enters the airspace. An ATC clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace. The cloud clearance requirement for VFR operations is "clear of clouds"

2.3.2 Operating Rules and Pilot/Equipment Requirements for VFR Operstions:

Regardless of weather conditions, an ATC clearance is required prior to operating within Class B airspace. Pilots should not request a clearsnce to operate within Class B airspace unless the requirements of FAR Part 91.215 and Part 91.131 are met. Included among these requirements are:

2.3.2.1 Unless otherwise authorized by ATC, aircraft must be equipped with an operable two-way radio capable of communicating with ATC on appropriate frequencies for that Class B airspace.

2.3.2.2 No person may take off or land a civil aircraft at the following primary airports within Class B airspace unless the pilot in command holds at least a private piiot certificate:

Andrews Air Force Base, MD (Washington, DC)
Atlanta Hartsfield Airport, GA
Boston Logan Airport, MA
Chicago O'Hare International Airport, IL
Dallas/Fort Worth International Airport, TX
Los Angeles International Airport, CA
Miami International Airport, FL
Newark International Airport, NJ
New York Kennedy Airport, NY
New York La Guardia Airport, NY
San Francisco International Airport, CA
Washington National Airport, DC

2.3.2.3 No person may take off or land a civil aircraft at an airport within Class B airspace or operate a civil aircraft within Class B airspace unless:

2.3.2.3.1 The pilot in command holds at least a private pilot certificate; or,

2.3.2.3.2 The aircraft is operated by a student pilot or recreational pilot who seeks private pilot certification and has met the requirements of FAR Part 61.95.

2.3.2.4 Unless otherwise authorized by ATC, each person operating a large turbine engine-powered airplane to or from a primary airport shall operate at or above the designated floors while within the lateral limits of Class B airspace.

2.3.2.5 Unless otherwise authorized by ATC, each aircraft must be equipped as follows:

2.3.2.5.1 For IFR operations, an operable VOR or TACAN receiver; and

2.3.2.5.2 For all operations, a two-way radio capable of communications with ATC on appropriate frequencies for that area; and

2.3.2.5.3 Unless otherwise authorized by ATC, an operable radar beacon transponder with automatic altitude reporting equipment.

Note.--ATC may, upon notification, immediately authorize deviations from the altitude reporting eguipment requirement; however, a request for deviation from the 4096 transponder equipment requirement must he submitted to the controlling ATC facility at least one hour before the proposed operation. (See RAC 1, Transponder Operation).

2.3.3 Charts: Class B airspace is charted on Sectional Charts,IFR En Route Low Altitude, and Terminal Area Charts.

2.3.4 Flight Procedures:

2.3.4.1 Flights: Aircraft within Class B airspace are required to operate in accordance with current IFR procedures. A clearance for a visual approach to a primary airport is not authorization for turbine powered airplanes to operate below the designated floors of the Class B airspace.

2.3.4.2 VFR Flights:

2.3.4.2.1 Arriving aircraft must obtain an ATC clearance prior to entering Class B airspace and must contact ATC on the appropriate frequency, and in relation to geographical fixes shown on local charts. Although a pilot may be operating beneath the floor of the Class B airspace on initial contact, communications with ATC should be established in relation to the points indicated for spacing and sequencing purposes.

2.3.4.2.2 Departing airaaft require a clearance to depart Class B airspace and should advise the clearance delivery position of their intended altitude and route of flight. ATC will normally advise VFR airaaft when leaving the geographical limits of the Class B airspace. Radar service is not automatically terminated with this advisory unless specifically stated by the controller.

2.3.4.2.3 Aircraft not landing or departing the primary airport may obtain an ATC clearance to transit the Class B airspace when traffic conditions permit and provided the requirements of FAR Part 91.131 are met. Such VFR airaaft are encouraged, to the extent possible, to operate at altitudes above or below the Class B airspace or transit through established VFR corridors. Pilots operating in VFR corridors are urged to use frequency 122.750 mHz for the exchange of aircraft position information.

2.3.5 ATC Clearances and Sepltnation: An ATC clearance is required to enter and operate within Class B airspace. VFR pilots are provided sequencing and separation from other aircraft while operating within Class B airspace (See RAC 1, Terminal VFR Radar Service)

Note I --Seperation and sequencing of VFR will be suspended in the event of a power outage as this service is dependent on radar. The pilot will advised that the service is not available and issued wind, runway information and the time or place to Contact the tower.

Note 2 --Separation of VFR aircraft will be suspended during CENRAP operations. Traffic advisories and sequencing to the primary airport will be provided on a workload permitting basis The pilot will be advised when Center Radar Presentation (CENRAP) is in use

2.3.5.1 VFR aircraft are separated from all VFR/IFR aircraft which weight 19,000 pounds or less by a minimum of

2.3.5.1.1 Target resolution, or

2.3.5.1.2 500 feet vertical separation, or

2.3.5.1.3 Visual separation

2.3.5.2 VFR aircraft are separated from all VFR/IFR aircraft which weigh more than 19,000 and turbojets by no less than

2.3.5.2.1 1 1/2 miles lateral separation, or

2.3.5.2.2 500 feet vertical separation, or

2.3.5.2.3 Visual separation

2.3.5.3 This program is not to be interpreted as relieving pilots of their responsibilities to see and avoid other traffic operating in basic VFR weather conditions, to adjust their operations and flight path as necessary to preclude serious wake encounters, to maintain appropriate terrain and obstruction clearance or to remain in weather conditions equal to or better than the minimums required by FAR Part 91155 Approach control should be advised and a revised clearance or instruction obtained when compliance with an assigned route, heading and/or altitude is likely to compromise pilot responsibility with respect to terrain and obstruction clearance, vortex exposure, and weather minimums

2.3 5.4 ATC may assign altitudes to VFR airaaft that do not conform to FAR Part 91.159. "RESUME APPROPRIATE VFR ALTITUDES" will be broadcast whcn the altitude assignment is no longer needed for separation or when leaving Class B airspace. Pilots must return to an altitude that conforms to FAR Part 91.159.

2.3.6 Proximity operations: VFR airaaft operating in proximity to Class B airspace are cautioned against operating too closely to the boundaries, especially where the floor of the Class B airspace is 3,000 feet or less or where VFR auise altitudes are at or near the floor of higher levels. Observance of this precaution will reduce the potential for encountering an aircraft operating at the altitudes of Class B floors. Additionally, VFR aircraft are encouraged to utilize the VFR Planning Chart as a tool for planning flight in proximity to Class B airspace. Charted VFR Flyway Planning charts are published on the back of the existing VFR Terminal Area Charts.

2.4 Class C Airspace

2.4.1 Definition: Generally, that airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations or passenger enplanements. Although the configuration of each Class C airspace area is individually tailored, the airspace usually consists of a surface area with a 5NM radius, and an outer area with a 10NM radius that extends from 1,200 feet to 4,000 feet above the airport elevation.

2.4.2 Outer Area: The normal radius will be 20NM, with some variations based on site specific requirements. The outer area extends outward from the primary airport and extends from the lower limits of radar/radio coverage up to the ceiling of the approach control's delegated airspace, excluding the Class C airspace and other airspace as appropriate.

2.4.3 Charts: Class C airspace is charted on Sectional Charts, IFR En Route Low Altitude, and Terminal Area Charts where appropriate.

2.4.4 Operatlng Rules and Pilot1Equipment Requirements:

2.4.4.1 Pilot Certification: No specific certification required.

2.4.4.2 Equipment:

2.4.4.2.1 Two-way radio, and

2.4.4.2.2 Unless otherwise authorized by ATC, an operable radar beacon transponder with automatic altitude reporting equipment.

2.4.4.3 Arrival or Through Flight Entrr Requirements: Two way radio communication must be established with the ATC facility providing ATC services prior to entry and thereafter maintain those communications while in Class C airspace. Pilots of arriving airaaft should contact the Class C airspace ATC facility on the publicized frequency and give their position, altitude, radar beacon code, destination, and request Class C service. Radio contact should be initiated far enough from the Class C airspace boundary to preclude entering Class C airspace beforetwo-way radio communications are established.

Note 1. --If the controller respondes to a radio call with, "(aircraft callsign) stanby", radio communications have been estblished and the piiot can enter the Class C airspace.

Note 2.--If workload or traffic conditions prevent immediate provision of Class C services, the controller will inform the pilot to remain outside the Class C airspace until conditions permit the services to be provided.

Example: (aircraft callsign) "Remain Outside the Class Charlie Airspace and Standby."

Note 3.--It is important to understand that if the controller responds to the initial radio call WITHOUT using the aircraft identification, radio communication hase not been established and the pilot my not enter the Class C airspace.

Example:"Aircraft Calling Dulles Approach Control. Standby."

2.4.4.4 Departures from:

2.4.4.4.1 A primary or satellite airport with an operating control tower: Two-way radio communications must be established and maintained with the control tower, and thereafter as instructed by ATC while operating in Class C airspace.

2.4.4.4.2 A satellite airport without an operating control tower: Two-way radio communications must be established as soon as practicable after departing with the ATC facility having jurisdiction over the Class C airspace.

2.4.4.5 Aircrait Speed: Unless otherwise authorized or required by ATC, no person may operate an airaaft at or below 2,500 feet above the surface within 4 nautical miles of the primary airport of a Class C airspace area at an indicated airspeed of more than 200 knots (230 mph).

2.4.5 Air Traftc Services: When two-way radio communications and radar conhct are established, all participating VFR aircraft are:

2.4.5.l Sequenced to the primary airport

2.4.5.2 Provided Class C services within the Class C airspace and the Outer Area.

2.4.5.3 Provided basic radar services beyond the outer area on a workload permitting basis. This can be terminated by the controller if workload dictates.

2.4.6 Aircraft Separatiton: Separation is provided within the Class C airspace and the Outer Area after two-way radio communications and radar contact are established. VFR aircraft are separated from IFR airaaft within the Class C airspace by any of the following:

2.4.6.1 Visual separation.

2.4.6.2 500 feet vertical; except when operating beneath a heavy jet.

2.4.6.3 Target resolution.

Note 1--Separation and sequencing of VFR aircraft will be suspended in the event of a radar outage as this service is dependent on radar. The pilot will be advised that the service is not availiable and issued wind, runway information with the time or place to contact the tower.

Note 2.--Separation of VFR aircraft will be suspended during CENRAP operations. Traffic advisories and sequencing to the primary airport will be provided on workload permittingng basis. The pilot will be advised when CENRAP is in use.

Note 3.--Pilot participation is voluntary within the outer area and can be discontinued, within the outer area at the pilots request. Class C services will be provided in the outer area unless the pilot requests termination of the service.

Note 4.--Some facilities provide Class C services only during published hours. At other times, terminal IFR radar service will be provided It is important to note that the communications requirements for entry into the airspace and transponder Mode C requirements are in effect at all times.

2.4.7 Secondary Airports:

2.4.7.1 In some locations Class C airspace may overlie the Class D surface area of a secondary airport. In order to allow that control tower to provide service to aircraft, portions of the overlapping Class C airspace may be procedurally excluded when the secondaq airport tower is in operation. Aircraft operating in these procedurally excluded areas will only be provided airport traffic control services when in communication with the secondary airport tower.

2.4.7.2 Aircraft proceeding inbound to a satellite airport will be terminated at a sufficient distance to allow time to change to the appropriate tower or advisory frequency. Class C services to these aircraft will be discontinued when the aircraft is instructed to contact the tower or change to advisoq frequency.

2.4.7.3 Aircraft departing secondaq controlled airports will not receive Class C services until they have been radar Identified and two-way communications have been established with the Class C airspace facility.

2.4.8 This program is not to be interpreted as relieving pilots of their responsibilities to see and avoid other traffic operating in basic VFR weather conditions, to adjust their operations and flight path as necessaq to preclude serious wake encounters, to maintain appropriate terrain and obstruction clearance or to remain in weather conditions equal to or better than the minimums required by FAR Part 91.155. Approach control should be advised and a revised clearance or instruction obtained when compliance with an assigned route, heading and/or altitude is likely to compromise pilot responsibility with respect to terrain and obstruction clearance, vortex exposure, and weather minimums.

2.5 Class D Airspace

2.5.1 Definition: Generally, that airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individuaily tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures.

2.5.2 Operating Rules and PiloVEquipment Requirements:

2.5.2.1 Pilot Certiflcation: No specific certification required.

2.5.2.2 Equipment: Unless othetwise authorized by ATC, an operable two-way radio is required.

2.5.2.3 Arrival or Through Flight Entrg Requirements: Two-way radio communication must be established with the ATC facility providing ATC services prior to entq and thereafter maintain those communications while in the Class D airspace. Pilots of arriving aircraft should contact the control tower on the publicized frequency and give their position, altitude, destination, and any request(s). Radio contact should be initiated far enough from the Class D airspace boundary to preclude entering the Class D airspace before two-way radio communications are established.

Note 1.--If the controller responds to a radio call with [aircraft call sign] STANDBY radio communications have been established and the pilot can enter the a ass D airspace.

Note 2.--If workload or traffic condidons prevent immediate entry into Class D airspace the controller will intorm the pilot to remain outside the Class D airspace until conditions permit entry.

Example:[aircraft call sign] "Remain Outside The Class Delta Airspaceand Standby."

Note 3.--It is important to understand that if the controller responds to the initial radio call without using the aircraft call sign radio communications have not been established and the pilot may not enter the Class D airspace.

Example:"Aircraft Calling Manassas Tower Standby."

NOTE 4.--At those airports where the control tower does not operate 24 hours a day, the operating hours of the tower will be listed on the appropriate charts and in the AFD. During the hours the tower is not in operation the Class E surface area rules are applicable.

2.5.2.4 Departures from:

2.5.2.4.1 A primary or satellite airport with an operating control tower: Two-way radio communications must be established and maintained with the control tower, and thereafter as instructed by ATC while operating in the Class D airspace.

2.5.2.4.2 A satellite airport without an operating control tower: Two-way radio communications must be established as soon as practicable after departing with the ATC facility having jurisdiction over the Class D airspace as soon as practicable after departing.

2.5.2.5 Aircraft Speed: Unless otherwise authorized or required by ATC, no person may operate an aircraft at or below 2,500 feet above the surface within 4 nautical miles of the primary airport of a Class D airspace area at an indicated airspeed of more than 200 knots (230 mph).

2.5.3 Class D airspace areas are depicted on Sectional and Terminal charts with blue segmented lines, and on IFR En Route Lows with a boxed [D].

2.5.4 Arrival extensions for instrument approach procedures may be Class D or Class E airspace. As a general rule, if all extensions are 2 miles or less, they remain part of the Class D surface area. However, if any one extension is greater than 2 miles, then all extensions become Class E.

2.5.5 Separation for VFR Aircraft: No separation services are provided to VFR aircraft.

2.6 Class E Airspace

2.6.1 Definition: Generally, if the airspace is not Class A, Class B, Class C, or Class D, and it is controlled airspace, it is Class E airspace.

2.6.2 Operating Rules and Pilot/Equipment Requirements:

2.6.2.1 Pilot Certification: No specific certification required.

2.6.2.2 Equipment: No specific equipment required by the airspace.

2.6.2.3 Arrival or Through Flight Entry Requirements: No specific requirements.

2.6.3 Charts: Class E airspace below 14,500 feet MSL is charted on Sectional, Terminal, World, and IFR En Route Low Altitude charts.

2.6.4 Vertical limits: Except for 18,000 feet MSL, Class E airspace has no defined vertical limit but rather it extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace.

2.6.5 Types of Class E Airspace:

2.6.5.1 Surface area designated for an airport: When designated as a surface area for an airport, the airspace will be configured to contain all instrument procedures.

2.6.5.2 Extension to a surface area: There are Class E airspace areas that serve as extensions to Class B, Class C, and Class D surface areas designated for an airport. Such airspace provides controlled airspace to contain standard instrument approach procedures without imposing a communications requirement on pilots operating under VFR.

2.6.5.3 Airspace used for transition: There are Class E airspace areas beginning at either 700 or 1,200 feet AGL used to transition to/from the terminal or en route environment.

2.6.5.4 En Route Domestic Areas: There are Class E airspace areas that extend upward from a specified altitude and are enroute domestic airspace areas that provide controlled airspace in those areas where there is a requirement to provide IFR en route ATC services but the Federal airway system is inadequate.

2.6.5.5 Federal Airways: The Federal airways are Class E airspace areas and, unless otherwise specified, extend upward from 1,200 feet to, but not including, 18,000 feet MSL. The colored airways are Green, Red, Amber, and Blue. The VOR airways are classified as Domestic, Alaskan, and Hawaiian.

2.6.5.6 Onshore Airspace Areas: There are Class E airspace areas that extend upward from a specified altitude to, but not including, 18,000 feet MSL and are designated as offshore airspace areas. These areas provide controlled airspace beyond 12 miles from the coast of the United States in those areas where there is a requirement to provide IFR en route ATC services and within which the United States is applying domestic procedures.

2.6.5.7 Unless designated at a lower aititude, Class E airspace begins at 14,500 MSL over the United States, including that airspace overlying the waters within 12 nautical miles of the coast of the 48 contiguous States and Alaska excluding the Alaska peninsula west of long. "160°00'00"W; and the airspace less than 1,500 feet above the surface of the earth.

2.6.6 Separatlon for VFR Aircraft: No separation services are provided to VFR aircraft.

3. CLASS G AIRSPACE

3.1 General

Class G airspace is that portion of the airspace that has not been designated as Class A, Class B, Class C, Class D and Class E airspace (uncontrolled).

3.2 VFR Requirements

Rules governing VFR flight have been adopted to assist the pilot in meeting his responsibility to see and avoid other aircraft. Minimum flight visibility and distance from clouds required for VFR flight are contained in FAR Part 91.155. (See RAC 3.4, Appendix One for a tabular presentation of these rules).

3.3 IFR Requirements

3.3.1 The FARs specify the pilot and aircraft equipment requirements for IFR flight. Pilots are reminded that in addition to altitude or flight level requirements, FAR Part 91.177 includes a requirement to remain at least 1,000 feet (2,000 feet in designated mountainous terrain) above the highest obstacle within a horizontal distance of 4 nautical miles from the course to be flown.

3.3.2 IFR Altitudes and Flight Levels. (See RAC 3.4, Appendix Two for a tabular presentation of these rules).

4. OTHER AIRSPACE AREAS

4.1 Airport Advisory Area

4.1.1 The airport advisory area is the area within 10 statute miles of an airport where a control tower is not operating but where a FSS is located. At such locations, the FSS provides advisory service to arriving and departing aircraft. (See RAC 7, Traffic Advisory Practices at Airports Without Operating Control Towers).

4.1.2 It is not mandatory that pilots participate in the Local Airport Advisory program, but it is strongly recommended that they do.

4.2 Published VFR Routes Published VFR routes for transitioning around, under and through complex airspace such as Class B airspace were developed through a number of FAA and industry initiatives. All of the following terms, i.e., "VFR Flyway", "VFR Corridor" "Class B Airspace VFR Transition Route" and "Terminal Area VFR Route" have been used when referring to the same or different types of routes or airspace. The following paragraphs identify and clarify the functionality of each type of route, and specify where and when an ATC clearance is required.

4.2.1 VFR Fly ways

4.2.1.1 VFR Fly ways and their associated Flyway Planning charts were developed from the recommendations of a National Airspace Review Task Group. A VFR Flyway is defined as a general flight path not defined as a specific course, for use by pilots in planning flights into, out of, through or near complex terminal airspace to avoid Class B airspace. An ATC clearance is NOT required to fly these routes.

4.2.1.2 VFR Fly ways are depicted on the reverse side of some of the VFR Terminal Area Charts (TAC), commonly referred to as Class B airspace charts. (See RAC 3.4; Appendix Four). Eventually all TAC's will include a VFR Flyway Planning Chart. These charts identify VFR fly ways designed to help VFR pilots avoid major controlled traffic flows. They may further depict multiple VFR routings throughout the area which may be used as an alternative to flight within Class B airspace. The ground references provide a guide for improved visual navigation. These routes are not intended to discourage requests for VFR operations within Class B airspace but are designed solely to assist pilots in planning for flights under and around busy Class B airspace without actually entering Class B airspace.

4.2.1.3 It is very important to remember that these suggested routes are not sterile of other traffic. The entire Class B airspace, and the airspace underneath it, msy be heavily congested with many different types of aircraft. Pilot adherence to VFR rules must be exercised at all times. Further, when operating beneath Class B airspace, communications must be established and maintained between your aircraft and any control tower while transiting the Class B, Class C, and Class D surface areas of those airports under Class B Airspace.

4.2.2 VFR Corridors

4.2.2.1 The design of a few of the first Class B airspace areas provided a corridor for the passage of uncontrolled trafffic. A VFR corridor is defined as Airspace through Class B airspace, with defined vertical and lateral boundaries, in which aircraft may operate without an ATC clearance or communication with air traffic control

4.2.2.2 These corridors are, in effect, a "hole" through Class B airspace. (See Class B Airspace Illustration). A classic example would be the corridor through the Los Angeles Class B airspace, which has been subsequently changed to Special Flight Rules airspace (SFR). A corridor is surrounded on all sides by Class B airspace and does not extend down to the surface like a VFR Flyway. Because of their finite lateral and vertical limits, and the volume of VFR trafffic using a corridor, extreme caution and vigilance must be exercised.

4.2.2.3 Because of the heavy traffic volume and the procedures necessary to efficiently manage the flow of traffic, it has not been possible to incorporate VFR corridors in the development or modifcations of Class B airspace in recent years.

4.2.3 Class B airspace VFR Transition Routes

4.2.3.1 To accommodate VFR traffic through certain Class B airspace, such as Seattle, Phoenix and Los Angeles, Class B Airspace VFR Transition Routes were developed. A Class B Airspace VFR Transition Route is defined as a specific flight course depicted on a Terminal Area Chart (TAC) for transiting a specific Class B airspace. These routes include specific ATCassigned altitudes, and pilots must obtain an ATC clearance prior to entering Class B airspace on the route.

4.2.3.2 These routes, as depicted in RAC 3.4; Appendix Five, are designed to show the pilot where to position his/her aircraft outside of, or clear of, the Class B airspace where an ATC clearance can normally be expected with minimal or no delay. Until ATC authorization is received, pilots must remain clear of Class B airspace. On initial contact, pilots should advise ATC of their position, altitude, route name desired, and direction of flight. After a clearance is received, pilot must fly the route as depicted and, most importantly, adhere to ATC instructions.

4.2.4 Terminal Area VFR Routes

4.2.4.1 Terminal Area VFR Routes were developed from a concept evaluated in the Los Angeles Basin area in 1988-89, and are being developed for other terminal areas uound the country. Charts depicting these routes were developed in a joint effort between the FAA and industry to provide more specific navigation information than the VFR Flyway Planning Charts on the back of the Class B airspace charts. (See RAC 3.4; Appendix Six),

4.2.4.2 A Terminal Area VFR Route is defined as a specific flight course for optional use by pilots to avoid Class B, Class C, and Class D airspace areas while operating in complex terminal airspace. These routes are depicted on the chart(s), may include recommended altitudes, and are described by refetence to electronic navigational aids and/or prominent visual landmarks. An ATC clearance is NOT required to fly these routes.

4.3 Terminal Radar Serlce Area (TRSA)

4.3.1 Background--The terminal radar service ueas (TRSA's) were originally established as part of the Terminal Radar Program at selected airports. TRSA's were never controlled airspace from a regulatory standpoint because the establishment of TRSA's were never subject to the rule making process; consequently, TRSA's are not contained in FAR Part 71 nor are there any TRSA operating rules in Part 91. Put of the Airport Radar Service Area (ARSA) program was to eventually replace all TRSA's. However, the ARSA requirements became relatively stringent and it was subsequently decided that TRSA's would have to meet ARSA criteria before they would be converted. TRSA's do not fit into uny of the U.S. Airspace Classes; therefore, they will continue to be non-Part 71 airspace areas where participating pilots can receive additional radu services which have been redeSned as TRSA Service.

4.3.2 TRSA Areas--The primary airport(s) within the TRSA become Class D airspace. The remaining portion of the TRSA overlies other controlled airspace which is normally Class E airspace beginning at 700 or 1,200 feet and established to transition to/from the en route/terminal environment.

4.3.3 Participation--Pilot's operating under VFR are encouraged to contact the radar approach control and avail themselves of the TRSA Services. However, participation is voluntary on the put of the pilot. See RAC 1 for details and procedures.

4.3.4 Charts--TRSA's are depicted on visual charts with a solid black line and altitudes for each segment. The Class D portion is charted with a blue segmented line.